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# How Ambient Humidity May Affect the Transmission of Viral Infectious Diseases

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Viral infectious diseases such as influenza have been a great burden to public health. The airborne transmission route is an important venue for the spread of many respiratory viral diseases. Many airborne viruses have been shown to be sensitive to ambient humidity, yet the mechanisms responsible for this phenomenon remain elusive. A thorough understanding of this phenomenon may provide insight into the temporal and spatial distribution of diseases. For instance, studies have repeatedly suggested ambient humidity as an important environmental determinant in the transmission of influenza in temperate regions. Further, knowing how to optimize humidity so as to minimize virus survival may have practical implications for disease prevention.

In this talk, we will discuss multiple mechanisms that may account for the association between humidity and viability of viruses in aerosols, including water activity, surface inactivation, salt toxicity, and conformational changes to the virus in response to varying pH.

As a case study, we will discuss our work on the effect of relative humidity (RH) on survival of influenza A virus (IAV) and how it may contribute to the transmission patterns of seasonal flu around the world. We measured the change in viability of IAV in droplets at various RHs. Results suggest three potential regimes defined by humidity: physiological ($\sim$100% RH) with high viability, concentrated ($\sim$50% to near 100% RH) with lower viability, and dry ($<\sim$50% RH) with high viability. Based on these results, we propose a mechanistic basis for the dependence of IAV's transmission on humidity. In temperate regions, the increase in influenza activity in winter may be due to enhanced transmission via the aerosol route thanks to IAV's higher viability in droplets at low RH. In tropical regions, transmission could be enhanced due to high viability of IAV at extremely high RH (rainy season), as observed in our study, possibly through both the aerosol route and the contact route.